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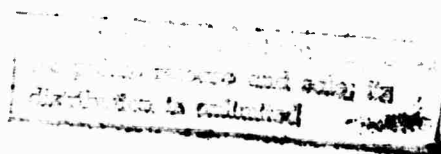*Memorandum 16*

CONCOMP

April 1968

PDP-8 TO 103A DATAPHONE AND/OR ONLINE TELETYPE INTERFACE

K. E. Burkhalter, Jr.

JUN 10 1968

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THE UNIVERSITY OF MICHIGAN

Memorandum 16

PDP-8 TO 103A DATAPHONE AND/OR ONLINE
TELETYPE INTERFACE

K.E. Burkhalter, Jr.

CONCOMP: Research in Conversational Use of Computers
F.H. Westervelt, Project Director
ORA Project 07449

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PDP-8 TO 103A DATAPHONE AND/OR ONLINE TELETYPE INTERFACE

K.E. Burkhalter, Jr.

Further Notes on PDP-8/103A Interface*

This report supersedes two previous reports on this subject, and reflects changes incorporated to improve performance (that is, level converters have been added between the PDP-8 TTY lines, and the following logic). The accompanying diagrams illustrate an interface between AT&T 103A data sets and a standard PDP-8 processor and its associated online teletype (TTY). The interfaces provide:

 a. connection of the DEC online TTY to the dial switch network;

 b. connection of the DEC online TTY to the PDP-8;

 c. connection of the PDP-8 to the dial switch network.

Figure 1 illustrates the possible modes of operation.

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* See also, Mills, D.L., Notes on PDP-8/103A Interfaces, Concomp Project internal memorandum, 25 September 1966; and Lundstrom, Stephen F., PDP-8/103A Dataphone Interface, Concomp Memorandum, November 1966.
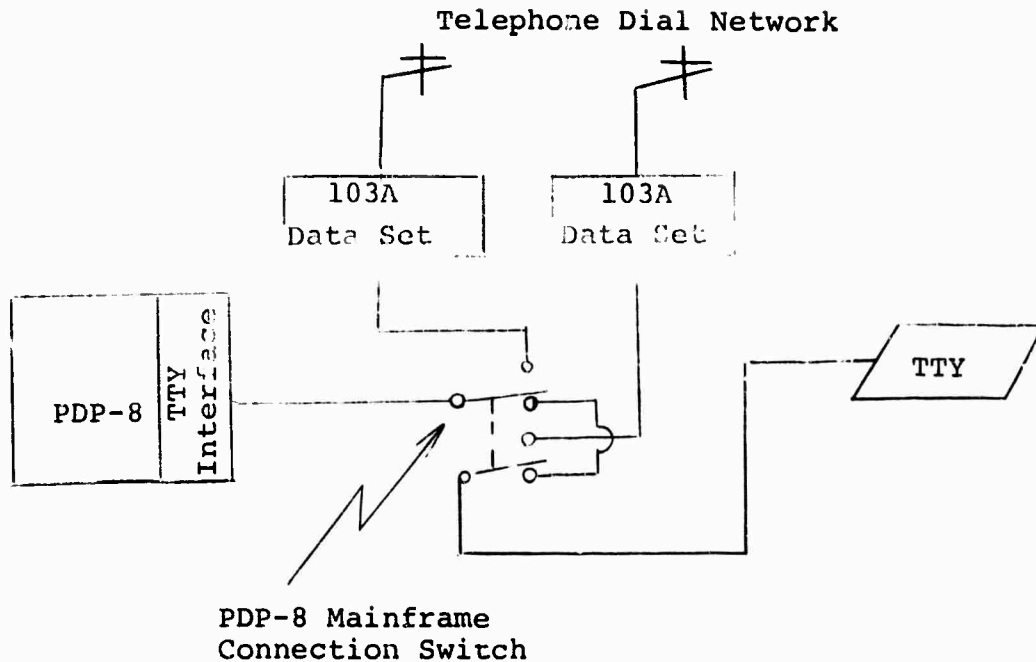
Telephone Dial Network

Figure 1

The interface takes care of interlocking the various
features so that chaos can not reign supreme. Thus, the TTY
can be used with its data set only if it is not attached to
the 8. When the TTY is switched to the PDP-8, terminal
ready drops on the TTY data set, disconnecting it from further
use, so that contention is not a problem. The reader advance
solenoid of the TTY is also brought TRUE at this time, so
that the reader may be used with the data set by throwing
the reader advance switch, on the reader, on and off. This
is necessary since the data set does not have an extra chan-
nel available to control the reader, as is the case with the
local processor. Note that the terminal ready lead of the

mainfraim data set is brought out to a switch so that it may be dropped if necessary to initiate a disconnect (a feature that has often bee.. found handy).

The PDP-8 may be switched back and forth between the two I/O devices (TTY, mainframe data set). If, however, either is actively engaged in data transmission, a few garbled characters will result. The interface forces a MARK condition on the unused port so that it will not chatter for the case of the TTY, or space disconnect for the data set. Also, since the switchover is done rapidly and while in MARK states (assuming no transmission) there is no SPACE transition and thus no "burping" of the teletype.

The state of the PDP-8 keyboard input and printer output lines is indicated on a lamp panel attached to the logic mounting bays. The lamps light for the SPACE rather than for the MARK state, thus allowing the lights to be normally off. The terminal ready lines of both data sets are also monitored via a front panel lamp each. In addition, as noted before, the terminal ready line for the mainframe data set is brought out to a front panel switch, which will normally be left in the on position.

One special board is required for the interface, to restore standard logic levels, since the PDP-8 TTY interface is designed to interface with solenoids rather than with logic gates. The solenoid driver used within the computer is the W050 which produces an output between -2 (on) and

-15 (off) volts. To restore these to ground and about -3
volts, a three-diode string (3-IN457As) is added at the
printer and reader output leads. The extra IN270 diode
on this board is used to pull the mainframe data set tran-
mit lead to the MARK state when the PDP-8 is connected to
the TTY.

DATA CONCENTRATOR EXTRAS

TTY, PDP-8 8

I03A DATA SET INTERFACE

DEC. 26, 1967   DSF, KEB
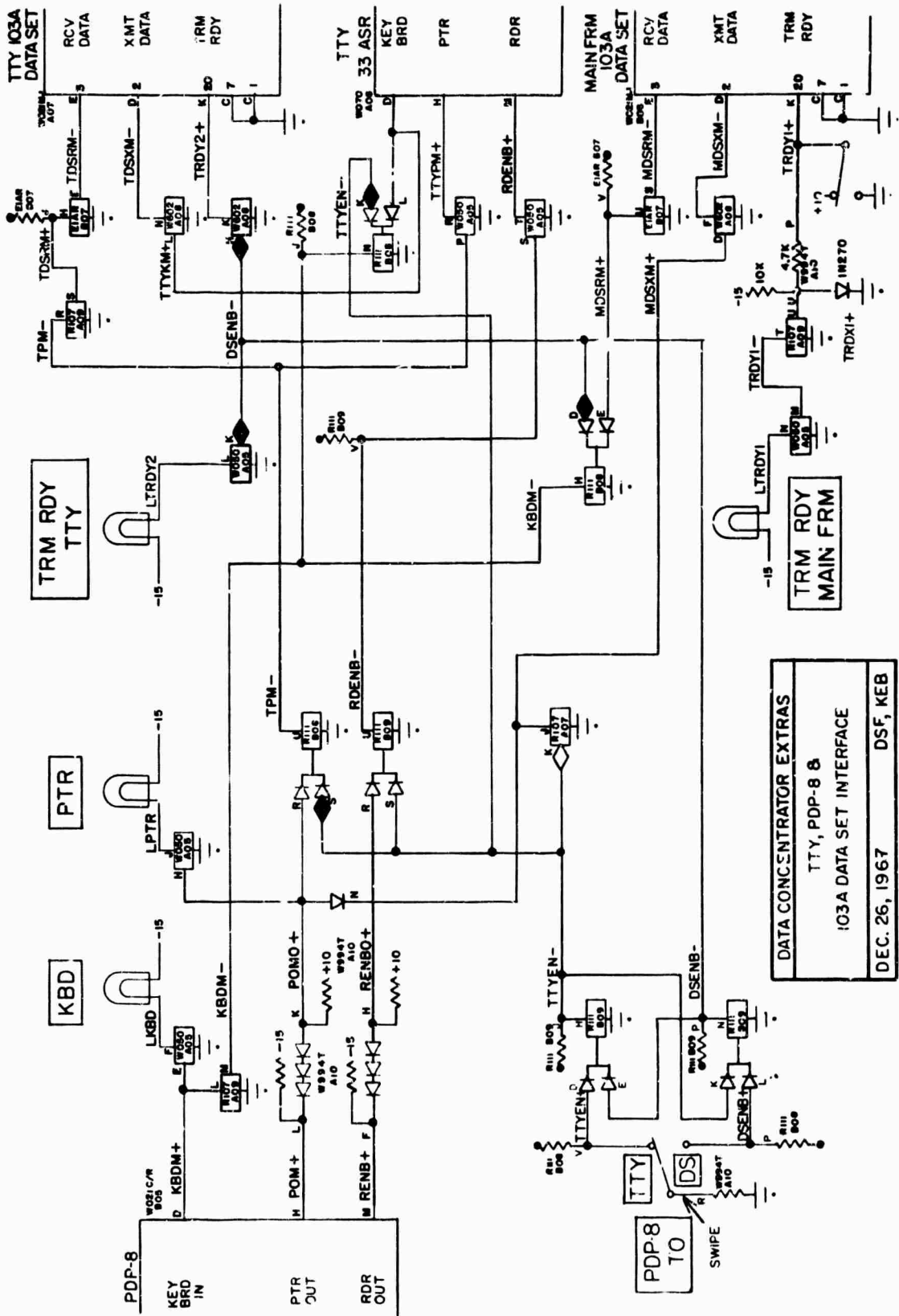
APPENDIX

APPENDIX

Wire wrap documentation is reproduced on the following pages as a servicing aid to those responsible for that function in the future.

WIRE WRAP (VERSION 27 JUNE)

INPUT LISTS

```
1A05 W050    DSENB-K  LTRDY2L  TRDY1-M  LTRDY1N  TP4-P    ITYPM+R  RDENB-S
1A05 W050    KBDM+E   LKBDF    POMO+H   LPTRJ    RDENB+T
1A06 W070    TTYKM+D  TTYPM+H  RDENA+M
1A07 W021MJ  TDSXM-D  TDSRM-E  TRDY2+K
1A08 W602    MDSXM+D  MDSXM-F  DSENB-H  TRDY2+K  TTYKM+L  TDSXM-N
1A08 W602    TMDS+P   TMDS-R   TMDS+S   TMDS-V
1A09 R107    TTYEN-K  MDSXM+J  KBDM-M   KBDM+L   TDSRM+S  TPM-R
1A09 R107    TRDX1+U  TRDY1-T
1A10 W994T   RENB+F   RENBO+H  POMO+K   POM+L    MDSXM+N  TRDY1+P
1A10 W994T   SWIPER   TRDX1+U
1B05 W021RC  KBDM+J   POM+H    RENB+M
1B06 W021M   MDSXM-D  MDSRM-E  TRDY1+K  STD10+A  STDGNDC
1B07 EIAR    GTDSR-D  GTDSR-C  TDSRM-E  TDSRM+J  TDSRM+H  GTDSR-R
1B07 EIAR    MDSRM-S  MDSRM+V  MDSRM+U
1B08 R111    DSENB+P  KBDM-N   POMO+R   TTYEN-S  TTYFN+V  TPM-U
1B08 R111    DSENB-D  MDSRM+E  KBDM-J   KBDM-H   TTYEN-K  TTYKM+L
1B09 R111    TTYFN+D  DSENB-E  TTYEN-J  TTYEN-H  TTYEN-K  DSENB+L
1B09 R111    DSENB-P  DSENB-N  RENBO+R  TTYEN-S  RDENB-V  RDENB-U
```

***** PDP-8 TO TTY/103A ADAPTER *****

CONCATONATED CIRCUIT LISTS

```
DSENB+      1B09L,1B08P
DSENB-      1A05K,1A08H,1B08D,1B09E,1B09N,1B09P
GTDSR-      1B07C,1B07D,1B07R
KBDM+       1B05D,1A05E,1A09L
KBDM-       1A09M,1B08H,1B08J,1B08N
LKBD        1A05F
I PTR       1A05J
LTRDY1      1A05N
LTRDY2      1A05L
MDSRM+      1B08E,1B07U,1B07V
MDSRM-      1B06E,1B07S
MDSXM+      1A08D,1A09J,1A10N
MDSXM-      1A08F,1B06D
POM+        1A10L,1B05H
POMO+       1A05H,1A10K,1B08R
RDENB+      1A06M,1A05T
RDENB-      1A05S,1B09U,1B09V
RENB+       1A10F,1B05M
RENBO+      1A10H,1B09R
STD10+      1B06A
STDGND      1B06C
SWIPE       1A10R
TDSRM+      1A09S,1B07H,1B07J
TDSRM-      1A07E,1B07E
TDSXM-      1A07D,1A08N
TMDS+       1A08P,1A08S
TMDS-       1A08R,1A08V
TPM-        1A05P,1A09R,1B08U
TRDX1+      1A09U,1A10U
TRDY1+      1A10P,1B06K
TRDY1-      1A05M,1A09T
TRDY2+      1A07K,1A08K
TTYEN+      1B09D,1B08V
TTYEN-      1B09S,1B08S,1B08K,1B09K,1B09H,1B09J,1A09K
TTYKM+      1A06D,1A08L,1B08L
TTYPM+      1A06H,1A05R
```

***** PDP-8 TO TTY/103A ADAPTER *****

CROSS-REFERENCE TABLES (****DENOTES LOCATION OF PIN BEING REFEREN(

```
1A05E    KBDM+      1B05D,*****,1A09L
1A05F    LKBD       *****
1A05H    POMO+      *****,1A10K,1B08R
1A05J    LPTR       *****
1A05K    DSENB-     *****,1A08H,1B08D,1B09E,1B09N,1B09P
1A05L    LTRDY2     *****
1A05M    TRDY1-     *****,1A09T
1A05N    LTRDY1     *****
1A05P    TPM-       *****,1A09R,1B08U
1A05R    TTYPM+     1A06H,*****
1A05S    RDENB-     *****,1B09U,1B09V
1A05T    RDENB+     1A06M,*****
1A06D    TTYKM+     *****,1A08L,1B08L
1A06H    TTYPM+     *****,1A05R
1A06M    RDENB+     *****,1A05T
1A07D    TDSXM-     *****,1A08N
1A07E    TDSRM-     *****,1B07E
1A07K    TRDY2+     *****,1A08K
1A08D    MDSXM+     *****,1A09J,1A10N
1A08F    MDSXM-     *****,1B06D
1A08H    DSENB-     1A05K,*****,1B08D,1B09F,1B09N,1B09P
1A08K    TRDY2+     1A07K,*****
1A08L    TTYKM+     1A06D,*****,1B08L
1A08N    TDSXM-     1A07D,*****
1A08P    TMDS+      *****,1A08S
1A08R    TMDS-      *****,1A08V
1A08S    TMDS+      1A08P,*****
1A08V    TMDS-      1A08R,*****
1A09J    MDSXM+     1A08D,*****,1A10N
1A09K    TTYEN-     1B09S,1B09S,1B08K,1B09K,1B09H,1B09J,*****
1A09L    KBDM+      1B05D,1A05E,*****
1A09M    KBDM-      *****,1B08H,1B08J,1B08N
1A09R    TPM-       1A05P,*****,1B08U
1A09S    TDSRM+     *****,1B07H,1B07J
1A09T    TRDY1-     1A05M,*****
1A09U    TRDX1+     *****,1A10U
1A10F    RENB+      *****,1B05M
1A10H    RENBO+     *****,1B09R
1A10K    POMO+      1A05H,*****,1B08R
1A10L    POM+       *****,1B05H
1A10N    MDSXM+     1A08D,1A09J,*****
1A10P    TRDY1+     *****,1B06K
1A10R    SWIPE      *****
1A10U    TRDX1+     1A09U,*****
1B05D    KBDM+      *****,1A05E,1A09L
1B05H    POM+       1A10L,*****
1B05M    RENB+      1A10F,*****
1B06A    STD10+     *****
1B06C    STOGND     *****
1B06D    MDSXM-     1A08F,*****
1B06E    MDSRM-     *****,1B07S
1B06K    TRDY1+     1A10P,*****
1B07C    GTDSR-     *****,1B07D,1B07R
1B07D    GTDSR-     1B07C,*****,1B07R
```

***** PDP-8 TO TTY/103A ADAPTER *****

```
1B07E    TDSRM-    1A07E,*****
1B07H    TDSRM+    1A09S,*****,1B07J
1B07J    TDSRM+    1A09S,1B07H,*****
1B07R    GTDSR-    1B07C,1B07D,*****
1B07S    MDSRM-    1B06E,*****
1B07U    MDSRM+    1B08E,*****,1B07V
1B07V    MDSRM+    1B08E,1B07U,*****
1B08D    DSENB-    1A05K,1A08H,*****,1B09E,1B09N,1B09P
1B08E    MDSRM+    *****,1B07U,1B07V
1B08H    KBDM-     1A09M,*****,1B08J,1B08N
1B08J    KBDM-     1A09M,1B08H,*****,1B08N
1B08K    TTYEN-    1B09S,1B08S,*****,1B09K,1B09H,1B09J,1A09K
1B08L    TTYKM+    1A06D,1A08L,*****
1B08N    KBDM-     1A09M,1B08H,1B08J,*****
1B08P    DSENB+    1B09L,*****
1B08R    POMO+     1A05H,1A10K,*****
1B08S    TTYEN-    1B09S,*****,1B08K,1B09K,1B09H,1B09J,1A09K
1B08U    TPM-      1A05P,1A09R,*****
1B08V    TTYEN+    1B09D,*****
1B09D    TTYEN+    *****,1B08V
1B09E    DSENB-    1A05K,1A08H,1B08D,*****,1B09N,1B09P
1B09H    TTYEN-    1B09S,1B08S,1B08K,1B09K,*****,1B09J,1A09K
1B09J    TTYEN-    1B09S,1B08S,1B08K,1B09K,1B09H,*****,1A09K
1B09K    TTYEN-    1B09S,1B08S,1B08K,*****,1B09H,1B09J,1A09K
1B09L    DSENB+    *****,1B08P
1B09N    DSENB-    1A05K,1A08H,1B08D,1B09E,*****,1B09P
1B09P    DSENB-    1A05K,1A08H,1B08D,1B09E,1B09N,*****
1B09R    RENBD+    1A10H,*****
1B09S    TTYEN-    *****,1B08S,1B08K,1B09K,1B09H,1B09J,1A09K
1B09U    RDENB-    1A05S,*****,1B09V
1B09V    RDENB-    1A05S,1B09U,*****
```

***** PDP-8 TO TTY/103A ADAPTER *****

OUTPUT LISTS

LKBD	1A05F	SINGLE I/O OR TEST CONNECTION
LPTR	1A05J	SINGLE I/O OR TEST CONNECTION
LTRDY1	1A05N	SINGLE I/O OR TEST CONNECTION
LTRDY2	1A05L	SINGLE I/O OR TEST CONNECTION
STD10+	1B06A	SINGLE I/O OR TEST CONNECTION
STDGND	1B06C	SINGLE I/O OR TEST CONNECTION
SWIPE	1A10R	SINGLE I/O OR TEST CONNECTION

***** PDP-8 TO TTY/103A ADAPTER *****

BAY 1 TO BAY 1, LEVEL 1

TMDS+	1	001	1A 08P	1A 08S
GTDSR-	1	001	1B 07C	1B 07D
DSENB-	1	001	1B 08D	1B 09E
TTYEN-	1	001	1B 09H	1B 09J
DSENB-	1	001	1B 09N	1B 09P
TRDY2+	1	002	1A 07K	1A 08K
TMDS-	1	002	1A 08R	1A 08V
TRDX1+	1	002	1A 09U	1A 10U
KBDM-	1	002	1B 08J	1B 08N
TTYEN-	1	002	1B 08K	1B 09K
TTYEN-	1	002	1B 08S	1B 09S
MDSXM+	1	003	1A 08D	1A 09J
RDENB+	1	003	1A 06M	1A 05T
DSENB+	1	003	1B 09L	1B 08P
TTYPM+	1	004	1A 06H	1A 05R
TTYKM+	1	005	1A 06D	1A 08L
TDSXM-	1	005	1A 07D	1A 08N
DSENB-	1	006	1A 08H	1A 05K
MDSRM-	1	006	1B 06E	1B 07S
MDSRM+	1	007	1B 08E	1B 07U
TTYEN+	1	008	1B 09D	1B 08V
TRDY1-	1	009	1A 05M	1A 09T
TPM-	1	009	1A 05P	1A 09R
TDSRM+	1	009	1A 09S	1B 07H
POMO+	1	010	1A 05H	1A 10K
KBDM-	1	010	1A 09M	1B 08H
KBDM+	1	011	1A 05E	1B 05D
TDSRM-	1	011	1A 07E	1B 07E
MDSXM-	1	012	1A 08F	1B 06D
TRDY1+	1	013	1A 10P	1B 06K
RENBO+	1	015	1A 10H	1B 09R
POM+	1	015	1A 10L	1B 05H
RDENB-	1	016	1A 05 S	1B 09U
RENB+	1	019	1A 10F	1B 05M

***** PDP-8 TO TTY/103A ADAPTER *****

BAY 1 TO BAY 1, LEVEL 2

TDSRM+	2	001	1B	07H	1B	07J
KBDM-	2	001	1B	08H	1B	08J
TTYEN-	2	001	1B	09H	1B	09K
MDSRM+	2	001	1B	07U	1B	07V
RDENB-	2	001	1B	09U	1B	09V
MDSXM+	2	003	1A	09J	1A	10N
TTYEN-	2	003	1B	08K	1B	08S
DSENB-	2	004	1B	09E	1B	09N
GTDSR-	2	005	1B	07D	1B	07R
KBDM+	2	009	1A	05E	1A	09L
DSENB-	2	010	1A	08H	1B	08D
TTYEN-	2	011	1A	09K	1B	09J
TTYKM+	2	011	1A	08L	1B	08L
TPM-	2	014	1A	09R	1B	08U
POMO+	2	015	1A	10K	1B	08R

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CARDS PUNCHED 0

NUMBER OF BUSS STRIPS 0

NUMBER OF WRAPS 49

TOTAL LENGTH OF WIRE 19

MODULE INVENTORY...PANEL 1		COST
EIAR	1	17.00
R107	1	24.00
R111	2	28.00
W021MJ	1	4.50
W050	1	13.00
W602	1	40.00
COST OF MODULES FOR THIS PANEL...	$	126.50

	A01	A02	A03	A04	A05	A06	A07	A08	A09	A10	A11
					W050	W07C	W021MJ	W602	R107	W094T	
A											
B											
C											
D							TTYKM+	TDSXM-	MDSXM+		
E					KBDM+		TDSRM-				
F					LKBD			MDSXM-		RFNB+	
H					POMO+	TTYPM+		DSENB-		RENBO+	
J					LPTR				MDSXM+		
K					DSENB-		TRDY2+	TRDY2+	TTYEN-	POMO+	
L					LTRDY2			TTYKM+	KBDM+	POM+	
M					TRDY1-	RDENB+			KBDM-		
N					LTRDY1			TDSXM-		MDSXM+	
P					TPM-			TMDS+		TRDY1+	
R					TTYPM+			TMDS-	TPM-	SWIPE	
S					RDENB-			TMDS+	TDSRM+		
T					RDENB+				TRDY1-		
U									TRDX1+	TRDX1+	
V								TMDS-			

	B01	B02	B03	B04	B05	B06	B07	B08	B09	B10	B11
					W021RC	W021M	EIAR	R111	R111		
A						STD10+					
B											
C						STDGND	GTDSR-				
D					KBDM+	MDSXM-	GTDSR-	DSENB-	TTYEN+		
E						MDSRM-	TDSRM-	MDSRM+	DSENB-		
F											
H					POM+		TDSRM+	KBDM-	TTYEN-		
J							TDSRM+	KBDM-	TTYEN-		
K							TRDY1+	TTYEN-	TTYEN-		
L								TTYKM+	DSENB+		
M					RFNB+						
N								KBDM-	DSENB-		
P								DSENB+	DSENB-		
R							GTDSR-	POMO+	RENBO+		
S							MDSRM-	TTYEN-	TTYEN-		
T											
U							MDSRM+	TPM-	RDENB-		
V							MDSRM+	TTYEN+	RDENB-		

A07	A08	A09	A10	A11	A12	A13	A14	A15	A16
W021MJ	W602	R107	W994T						

TDSXM-	MDSXM+					A
TDSRM-						B
	MDSXM-		RFNB+			C
	DSENB-		RENBO+			D
		MDSXM+				E
TRDY2+	TRDY2+	TTYEN-	POMO+			F
	TTYKM+	KBDM+	POM+			H
		KBDM-				J
	TDSXM-		MDSXM+			K
	TMDS+		TRDY1+			L
	TMDS-	TPM-	SWIPE			M
	TMDS+	TDSRM+				N
		TRDY1-				P
		TRDX1+	TRDX1+			R
	TMDS-					S

B07	B08	B09	B10	B11	B12	B13	B14	B15	B16
EIAR	R111	R11'							

GTDSR-				A
GTDSR-	DSENB-	TTYEN+		B
TDSRM-	MDSRM+	DSENB-		C
TDSRM+	KBDM-	TTYEN-		D
TDSRM+	KBDM-	TTYEN-		E
	TTYEN-	TTYEN-		F
	TTYKM+	DSENB+		H
	KBDM-	DSENB-		J
	DSENB+	DSENB-		K
GTDSR-	POMO+	RENBO+		L
MDSRM-	TTYEN-	TTYEN-		M
MDSRM+	TPM-	RDENB-		N
MDSRM+	TTYEN+	RDENB-		P

A17 A18 A19 A20 A21 A22 A23 A24 A25 A26

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	Advanced Research Projects Agency

13. ABSTRACT

DD FORM 1 JAN 64 1473

14. KEY WORDS	LINK A		LINK B		LINK C	
	ROLE	WT	ROLE	WT	ROLE	WT

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